

## CLAIMS

What is claimed is:

1. A lock cylinder comprising:
  - an outer cylinder having a first bore formed along a first longitudinal axis;
  - an inner cylinder rotatably disposed within said first bore;
  - a pin assembly disposed within said inner and outer cylinders, said pin assembly operable to selectively lock said inner cylinder relative to said outer cylinder, said pin assembly comprising:
    - an upper shear cylinder positionable relative to said outer cylinder;
    - a lower shear cylinder positionable relative to said inner cylinder, said upper and lower shear cylinders movable to define a first shear line therebetween;
    - an upper pin slidable within said upper shear cylinder; and
    - a lower pin slidable within said lower shear cylinder, said upper and lower pins defining a second shear line therebetween;
  - wherein the lock cylinder is positionable from a locked position to an unlocked position when said first shear line is aligned with said second shear line.

2. The lock cylinder of claim 1 further comprising a first lock rack, said first lock rack operable to lock said upper shear cylinder in a plurality of positions relative to said outer cylinder.

3. The lock cylinder of claim 1 further comprising a second lock rack, said second lock rack operable to lock said lower shear cylinder in a plurality of positions relative said inner cylinder.

4. The lock cylinder of claim 1 wherein said pin assembly further comprises an upper lock pin and a lower lock pin, said upper lock pin operable to lock said upper pin to said upper shear cylinder when said first shear line is aligned with said second shear line and said lower lock pin operable to lock said lower pin to said lower shear cylinder when said first shear line is aligned with said second shear line.

5. The lock cylinder of claim 4 wherein said upper pin includes a first bore to matingly receive said upper lock pin and said lower pin includes a second bore to matingly receive said lower lock pin.

6. The lock cylinder of claim 4 wherein said upper lock pin is biased out of engagement with said upper pin by a first biasing member and said lower lock pin is biased out of engagement with said lower pin by a second biasing member.

7. The lock cylinder of claim 6 wherein said first biasing member is a spring and said second biasing member is a spring.

8. The lock cylinder of claim 5 further comprising an upper cam and a lower cam, said upper cam operable to urge said upper lock pin into engagement with said upper pin and said lower cam operable to urge said lower lock pin into engagement with said lower pin.

9. The lock cylinder of claim 8 wherein said upper cam includes an engagement surface, said engagement surface operable to receive said inner cylinder upon rotation of said inner cylinder to rotate said upper cam and urge said upper locking pin into engagement with said upper pin.

10. The lock cylinder of claim 8 wherein said lower cam includes a second engagement surface, said second engagement surface operable to engage said outer cylinder upon rotation of said inner cylinder to translate said lower cam and urge said lower locking pin into engagement with said lower pin.

11. The lock cylinder of claim 1 wherein said upper shear cylinder is biased in a first direction generally toward said lower shear cylinder.

12. The lock cylinder of claim 1 wherein said lower shear cylinder is biased in a first direction generally away from said upper shear cylinder.

13. The lock cylinder of claim 1 wherein said upper shear cylinder includes a first spring disposed therein and said lower shear cylinder includes a second spring disposed therein, said first spring operable to allow said upper pin to move within, and relative to, said upper shear cylinder and said second spring operable to allow said lower pin to move within, and relative to, said lower shear cylinder.

14. The lock cylinder of claim 1 wherein said lower shear cylinder includes a recess, said recess operable to receive a key.

15. The lock cylinder of claim 1 further comprising a plurality of pin assemblies.

16. A lock cylinder comprising:
- an outer cylinder having a first bore formed along a first longitudinal axis;
  - an inner cylinder rotatably disposed within said first bore;
  - a shear zone defined between said outer and inner cylinders;
  - a lock assembly disposed within said inner and outer cylinders, said lock assembly operable to selectively lock said inner cylinder relative to said outer cylinder, said pin assembly comprising:
    - an upper shear cylinder positionable relative to said outer cylinder;
    - a lower shear cylinder positionable relative to said inner cylinder, said upper and lower shear cylinders movable to define a first shear line therebetween; and
    - an upper lock rack, said upper lock rack operable to lock said upper shear cylinder in a plurality of positions relative to said outer cylinder; and
    - a lower lock rack, said lower lock rack operable to lock said lower shear cylinder in a plurality of positions relative said inner cylinder;
  - wherein said upper and lower lock racks lock said upper and lower shear cylinders relative said inner and outer cylinders to maintain said first shear line within said shear zone.

17. The lock cylinder of claim 16 wherein said lock assembly includes an upper pin and a lower pin, said upper pin biased in a first direction and slidably received within said upper shear cylinder and said lower pin biased in a second direction and slidably received with in said lower shear cylinder.

18. The lock cylinder of claim 17 wherein said upper and lower pins define a second shear line therebetween, said second shear line operable to align with said first shear line to allow said inner cylinder to rotate relative said outer cylinder.

19. The lock cylinder of claim 17 wherein said upper shear cylinder includes an upper holding pin and said lower shear cylinder includes a lower holding pin, said upper holding pin operable to lock said upper pin relative said upper shear cylinder when said first and second shear lines are aligned and said lower holding pin operable to lock said lower pin relative said lower shear cylinder when said first and second shear lines are aligned.

20. The lock cylinder of claim 19 wherein said upper holding pin engages a first cam and said lower holding pin engages a second cam, said first cam operable to translate said upper holding pin into engagement with said upper pin when said first and second shear lines are aligned and said second cam operable to translate said lower holding pin into engagement with said lower pin when said first and second shear lines are aligned.

21. The lock cylinder of claim 19 wherein said first holding pin is biased out of engagement with said upper pin and said second holding pin is biased out of engagement with said lower pin.

22. The lock cylinder of claim 20 wherein said first cam includes a flange, said flange operable to engage said inner cylinder when said inner cylinder rotates relative said outer cylinder.

23. The lock cylinder of claim 20 wherein said second cam abuts an inner surface of said outer cylinder, said outer surface operable to translate said second cam upon rotation of said inner cylinder relative said outer cylinder.

24. The lock cylinder of claim 16 wherein said upper shear cylinder is biased by a first biasing member in a first direction, said first biasing member operable to bias said upper and lower shear cylinders in said first direction.

25. The lock cylinder of claim 24 wherein said upper shear cylinder further comprises an upper lock pin and said lower shear cylinder includes a lower lock pin, said upper lock pin operable to lock said upper shear cylinder to said upper lock rack and said lower lock pin operable to lock said lower shear cylinder to said lower lock rack.

26. The lock cylinder of claim 16 further comprising a plurality of lock assemblies.



27. A method of re-keying a lock cylinder comprising:

inserting a first key into said lock cylinder, said first key operable to allow rotation of an inner cylinder relative an outer cylinder;

providing a lock assembly including an upper pin, upper shear cylinder, lower pin, and lower shear cylinder, said lock assembly operable to lock said inner cylinder to said outer cylinder;

translating a first lock pin within said upper shear cylinder and out of engagement with a lower lock rack;

engaging said upper lock pin with said upper shear cylinder and said upper pin;

translating a second lock pin within said lower shear cylinder and out of engagement with a lower lock rack;

engaging said lower lock pin with said lower shear cylinder and said lower pin;

removing said first key;

providing a force to said upper shear cylinder, said force operable to set said upper and lower shear cylinders in a first position relative said upper and lower lock racks;

inserting a second key into said lock cylinder, said second key including an engagement surface operable to engage said second pin;

positioning said upper shear cylinder, upper pin, lower shear cylinder, and lower pin relative said upper and lower lock racks via said second key;

disengaging said upper lock pin from said upper pin;  
engaging said upper lock pin with said upper lock rack and said upper shear cylinder;  
disengaging said lower lock pin from said lower pin;  
engaging said lower lock pin with said lower lock rack and said lower shear cylinder.

28. The method according to claim 27 further comprising the step of providing a plurality of a lock assemblies.

29. The method according to claim 27 wherein said force is applied by a spring.

30. A method of re-keying a lock cylinder comprising:

providing a lock cylinder having a plurality of pin positions, each pin position having a longitudinal axis and a shear interface movable along the longitudinal axis;

inserting a first valid key in the cylinder to move each shear interface along its respective longitudinal axis;

rotating the lock cylinder from a home position to a learn position;

replacing the first valid key with a second valid key;

rotating the lock cylinder back to the home position; and

removing the second valid key.

31. A lock cylinder comprising:

a plurality of pin positions, each pin position having a longitudinal axis and a shear interface movable along the longitudinal axis.